ecology and environment, inc.
160 SPEAR STREET, SAN FRANCISCO, CALIFORNIA 94105, TEL. 415/777-2811
International Specialists in the Environment

# FEDERAL FACILITY
# PRELIMINARY ASSESSMENT/SITE INSPECTION REVIEW

SUBMITTED TO: Carolyn Douglas, Federal Facilities Coordinator
EPA Region IX

PREPARED BY: Kimberly Hall, Ecology and Environment, Inc.

THROUGH: Lorene Flaming, Ecology and Environment, Inc. LCF

DATE: August 25, 1989

FACILITY: Vandenberg Air Force Base

TDD#: F9-8903-007

EPA ID#: CA9570025149

PROGRAM ACCOUNT#: FCA0644SAA

FIT REVIEW/CONCURRENCE:

cc: FIT Master File
Tom Mix, EPA
Julie Anderson, EPA

## 1. INTRODUCTION

In accordance with Section 120 of the Superfund Amendments and Reauthorization Act of 1986, all federal facilities listed on the Federal Agency Hazardous Waste Compliance Docket were required to submit a Preliminary Assessment (PA) to the U.S. Environmental Protection Agency (EPA) by April 17, 1988. Upon completion of the PA, facilities were requested to perform a Site Inspection (SI) of sites at the facility that warranted further investigation. Ecology and Environment, Inc.'s Field Investigation Team (FIT) has been tasked to review the PA/SI submitted by the United States Air Force for Vandenberg Air Force Base to ensure that an accurate response determination is made.

wp/kh/vandenberg/ffsi

The strategy for determination of further action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is based solely on each facility's potential to achieve a sufficient score on the Hazard Ranking System (HRS) for inclusion on the National Priorities List (NPL). This strategy is intended to identify those sites posing the highest relative risk to human health or the environment.

This facility was evaluated primarily using the original HRS model; however, it was also assessed for its potential to score under the proposed revised HRS model. Following is a summary of FIT's findings with regard to this facility.

## 2. FACILITY DESCRIPTION

Vandenberg Air Force Base (AFB) is located in Santa Barbara County on the south-central coast of California (refer to Figure 1). The City of Lompoc, with a population of approximately 26,000 people, is located six miles east of the base. A United States penitentiary is situated on the eastern border of the base, directly north of Lompoc. The penitentiary, and the low-security facility located nearby, have a combined population (inmates and staff) of 2,600 people (11). Vandenberg AFB is situated on more than 98,400 acres along 35 miles of coast, making it the third largest United States Air Force (USAF) installation. Base facilities include approximately 1,000 buildings and 2,080 family housing units supporting more than 22,300 people (10). The base is bordered on the west and south by the Pacific Ocean, to the north and northeast by the Casmalia Hills, and to the east by the Lompoc and Purisima Hills.

Vandenberg AFB has operated since 1958 as a missile test base and aerospace center. In December 1958, the first missile was launched from the base and since that time more than 1,500 Intercontinental Ballistic Missiles (ICBMs) and Polar Orbiting Satellites have been launched (10).

The Department of Defense (DOD) developed the Installation Restoration Program (IRP) to identify and evaluate past hazardous waste sites on DOD property. The following documents were completed under the IRP and used in preparing this report:

- IRP Phase 1: Records Search (PA equivalent), conducted by Environmental Science and Engineering, Inc., Gainseville, Florida; and

- IRP Phase 2: Confirmation/Quantification Stage 1 Final Report (SI equivalent), conducted by Battelle Columbus Division, Denver, Colorado.

Fifteen sites were identified during the Phase I investigation as having potential for environmental contamination. This number was increased to 44 sites during the Phase II Field Evaluation based on the findings of the Phase I investigation, the Phase II pre-survey site visit, and interviews with Air Force personnel. Table 1 lists these 44 sites and briefly describes past activities at each site (refer to Figure 2).

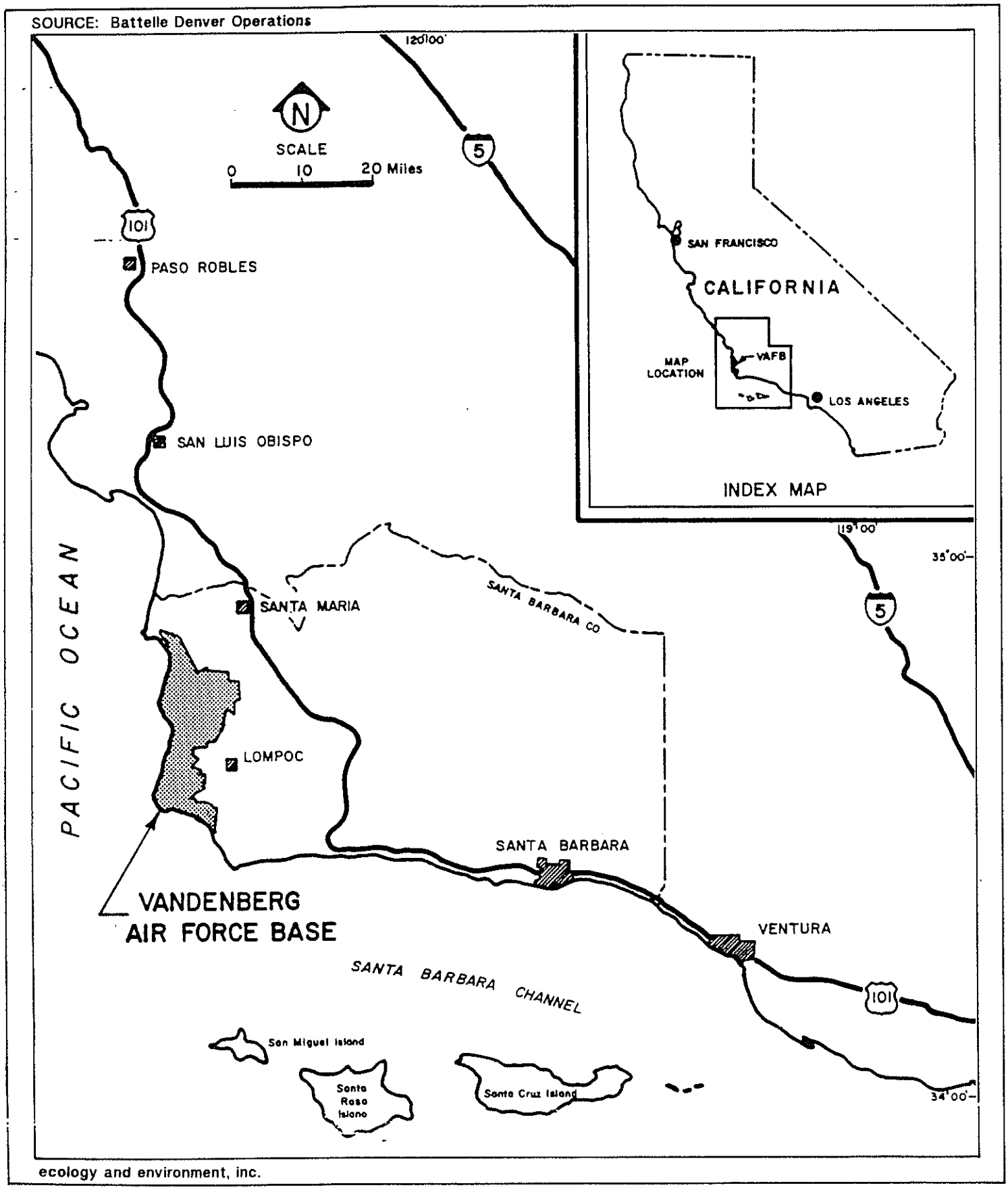


Figure 1 GENERAL LOCATION MAP FOR VANDENBERG AFB

SOURCE: Battelle Denver Operations

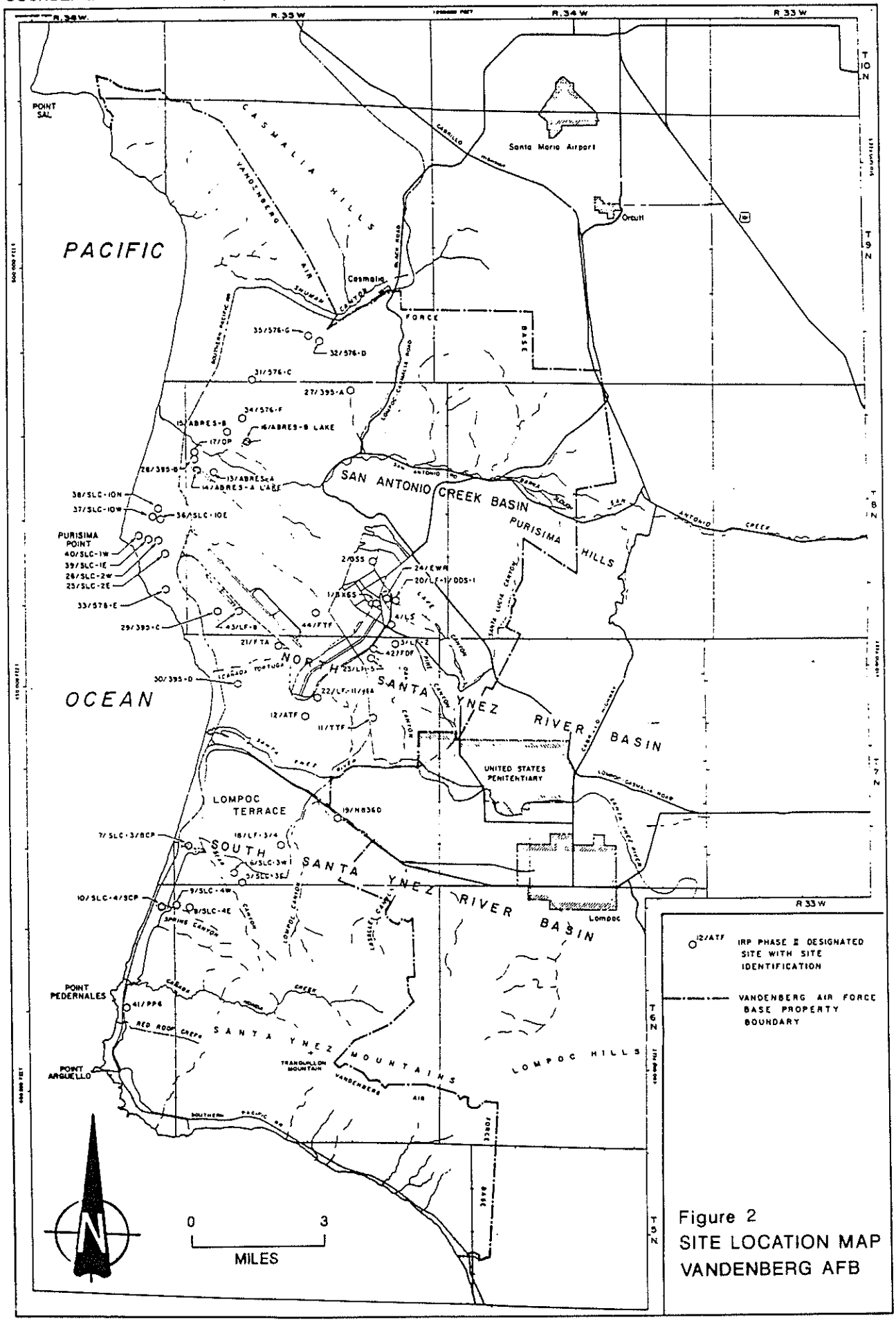


Figure 2
SITE LOCATION MAP
VANDENBERG AFB

ecology and environment, inc.

Table 1 WASTE SITES, DISPOSAL HISTORY, AND WASTE CHARACTERISTICS - VANDENBERG AFB

| IRP Site | Type of Waste (Refer to the list of abbreviations at end of table) | Method of Disposal and Approximate Dates or | Waste Quantity Landfill Capacity |
|---|---|---|---|
| Site 1<br>BX Service Station | Gasoline | Possible leaking underground fuel storage tank, 1967-1985 | Variable quantities of diluted ethyl glycol discharged to storm drain |
| Site 2<br>Old Service Station | Gasoline | Suspected leakage from disconnected underground pipes, (+/-) 1941-1963 | Unknown |
| Site 3<br>Landfill No. 2/Bionetics | Sanitary fill, Bomarc missile scrap, waste POLs, pesticides, solvents, transformer oil (PCBs), paint stripper, TCA, Cyanide, NaOH, HNO3, HCL, HF | Fill material deposited in natural canyon from 1941 to present. Hazardous waste has not been deposited in this landfill since 1982. | 140 acres |
| Site 4<br>Laundry Site | TCE | TCE was disposed of from (+/-) 1941 to 1967; disposal method is unknown. | Unknown |
| Site 5<br>Space Launch Complex No. 3 East | TCE, mixed solvents, lube oil, hydraulic fluids | Concentrated wastes were landfilled from 1958 to 1965, and disposed of under contract from 1965 to present. TCE dilution water was neutralized and discharged to grade from 1960 to 1973. | 150-180 gal TCE per launch, 350,000 to 550,000 gal/yr of TCE dilution water, 400 gal/yr mixed solvents, 1,400 gal/yr lube oil and hydraulic fluid |
| Site 6<br>Space Launch Complex No. 3 West | TCE, mixed solvents, lube oil, hydraulic fluids | Concentrated wastes were landfilled from 1958 to 1965, and disposed of under contract from 1965 to present. TCE dilution water was neutralized and discharged to grade from 1960 to 1973. | 150-180 gal TCE per launch, 350,000 to 550,000 gal/yr of TCE dilution water, 400 gal/yr mixed solvents, 1,400 gal/yr lube oil and hydraulic fluid |

*Entries noted "Unknown" or "+/-" designate unconfirmed information from Air Force sources made available to Battelle.

Table 1 WASTE SITES, DISPOSAL HISTORY, AND WASTE CHARACTERISTICS - VANDENBERG AFB (Continued)

| IRP Site | Type of Waste | Method of Disposal and Approximate Dates | Waste Quantity or Landfill Capacity |
|---|---|---|---|
| Site 7<br>Space Launch Complex<br>No. 3/Bear Creek Ponding | Refer to sites 5 and 6 | Refer to sites 5 and 6 | Refer to sites 5 and 6 |
| Site 8<br>Space Launch Complex<br>No. 4 East | Fuels: AZ-50, UDMH, and hydrazine; TCE, N204, Lube oil, paint slops | Waste rocket fuels have been neutralized and discharged to grade since 1958. Lube oil was landfilled from 1958 to 1960, burned in firefighter training from 1960 to 1965, and contract disposed of from 1965 to present. TCE was diluted and discharged to grade from 1963 - 1967. Paint slops were landfilled, and all remaining wastes were neutralized and discharged to grade. | 150 gal/yr neutralized Aerozine-50, 150-180 gal TCE per Atlas/Titan Launch, 25 gal/launch neutralized N204, 1,500 gal/launch IFRNA neutralization water, and 150 gal/yr lube oil |
| Site 9<br>Space Launch Complex<br>No. 4 West | Refer to site 8 | Refer to site 8 | Refer to site 8 |
| Site 10<br>Space Launch Complex<br>No. 4/Spring Canyon Pond | Refer to site 8 | Refer to site 8 | Refer to site 8 |
| Site 11<br>Titan Tank Farm | N204 and AZ-50 | N204 has been burned in a propane-fired burner from 1963 to present, AZ-50 was neutralized and discharged to grade from 1963 to 1984, when contract disposal began. | <5 gal/yr N204 (burned on-site), 1,000 gal/yr of neutralized N204 contaminated water, <5 gal/yr AZ-50, and 25,500 gal/yr neutralized AZ-50 contaminated water |

Table 1 WASTE SITES, DISPOSAL HISTORY, AND WASTE CHARACTERISTICS – VANDENBERG AFB (Continued)

| IRP Site | Type of Waste | Method of Disposal and Approximate Dates | Waste Quantity or Landfill Capacity |
|---|---|---|---|
| Site 12<br>Agena Tank Farm | IRFNA, UDMH, MMH, waste fuel with N204 and AZ-50 | Since 1961, waste IRFNA has been neutralized and discharged to grade. Waste UDMH and MMH was neutralized and discharged to grade from 1961 to 1984, when contract disposal began. Waste fuel was neutralized and discharged to grade. | 35 gal/yr neutralized IRFNA, 44,000 gal/yr neutralized IRFNA contaminated water, <5 gal/yr neutralized UDMH, 10,000 gal/yr neutralized UDMH contaminated water, <5 gal/yr neutralized MMH, 80 gal/yr neutralized AZ-50, 52,000 gal/yr neutralized AZ-50 contaminated water |
| Site 13<br>Advanced Ballistic Rentry System A | Uncertain, probably similar to sites 5 and 6 | Atlas launches, probably similar to sites 5 and 6 (1959-1974) (currently Minuteman Launch Pad #3) | Uncertain, probably similar to sites 5 and 6 |
| Site 14<br>Advanced Ballistic Reentry System A Lake | Uncertain, probably similar to sites 5 and 6 | Discharges from neutralization Lagoon (1961-1982) | Uncertain, probably similar to sites 5 and 6 |
| Site 15<br>Advanced Ballistic Rentry | Uncertain, probably similar to sites 5 and 6 | Atlas Launches, probably similar to sites 5 and 6 (1960 to 1967) | Uncertain, probably similar to sites 5 and 6 |
| Site 16 | Refer to sites 5 and 6 | Refer to sites 5 and 6 | Refer to sites 5 and 6 |
| Site 17<br>Oxidation Ponds | #2 diesel fuel, AZ-50, N204 | Two ponds connected to Missile Silo 395-B (1964 to 1969 (+/-)) | Unknown |
| Site 18<br>Landfill No. 3 and 4 | Sanitary fill, waste POLs, construction debris, pesticides | Landfill from 1959 to 1964. No burning was conducted at either fill. | Landfill 3: 10 acres<br>Landfill 4: 5 acres |
| Site 19<br>NASA Building 836 Ditch | Waste oils and solvents | Disposal in drainage ditch from 1958 to 1964. | Unknown |

wp2/kh/vandenberg/tbl1

Table 1 WASTE SITES, DISPOSAL HISTORY, AND WASTE CHARACTERISTICS – VANDENBERG AFB (Continued)

| IRP Site | Type of Waste | Method of Disposal and Approximate Dates | Waste Quantity or Landfill Capacity |
|---|---|---|---|
| Site 20<br>Landfill No. 1/<br>Drum Disposal Site No. 1 | Incinerator ash, unburnable slag, scrap metal, pesticides, waste POLs, solvents, UXO | Landfill from 1942 to 1957 and drums buried in 1957 south of the landfill | Landfill approximately 10 acres, Fifty buried drums |
| Site 21<br>Fire Training Area | JP-4 jet fuel | Fuel was burned in an unlined bermed area connected to drain with oil/water separator. | 500-600 gal/exercise |
| Site 22<br>Landfill No. 11<br>Landfill No. 11A | Ash, unburnable slag, waste POLs | Surface fill (both sites) and dumping (LF-11); Landfill-11 in operation from mid-1940s to late-1950s; landfill 11A in operation from 1941 to late-1950s. | Landfill 11: 5 acres<br>Landfill 11A: Unknown |
| Site 23<br>Landfill No. 5 | Sanitary fill, construction debris, scrap metal, unconfirmed POLs | Landfill, no burning (area fill) (1944 – 1959) | 60 acres |
| Site 24<br>Entomology Wash Rack | Pesticides: DDT, chlordane, toxaphene | Surface soil and stormwater drainage (1965 – 1982) | Unknown |
| Site 25<br>Space Launch Complex No. 2 East | Hydrazine, N204, TCE, isopropyl alcohol, Freon 113 | Discharges of neutralization waters from Delta/Thor missile launches (1958 – 1984); these wastes were both landfilled and contract disposed of. | <5 gal/yr neutralized hydrazine, 31,000 gal/yr diluted hydrazine neutralization water, <2 gal/yr neutralized N204, 17,000 gal/yr neutralized N204 contaminated water, 250 gal/yr TCE, 150 gal/yr isopropyl alcohol, and 400 gal/yr Freon 113 |
| Site 26 | Refer to site 25 | Refer to site 25 | Refer to site 25 |

Table 1 WASTE SITES, DISPOSAL HISTORY, AND WASTE CHARACTERISTICS - VANDENBERG AFB (Continued)

| IRP Site | Type of Waste | Method of Disposal and Approximate Dates | Waste Quantity or Landfill Capacity |
|---|---|---|---|
| Site 27<br>Missile Silo 395-A | TCE, AZ-50, N204, NDMA, RP-1 | Discharges from Titan I and II missile launches, and Titan I missile explosion (1961 - 1965) | 80 - 120 gal TCE per Titan missile launch |
| Site 28<br>Missile Silo 395-B | #2 diesel fuel, AZ-50, N204, hydrazine, Freon 113 | Discharges from Titan II missile launches (1964 - 1969) | Unknown |
| Site 29<br>Missile Silo 395-C | #2 diesel fuel, AZ-50, N204 | Discharges from Titan II missile launches, oxidation pond for domestic sewage (1963 - 1976) | Unknown |
| Site 30<br>Missile Silo 395-D | AZ-50, N204, #2 diesel fuel, solvents, transformer oil (PCBs) | Discharges from Titan II missile launches, leaking drums (1963 - 1966), and transformers (1978 - 1980) | Unknown |
| Site 31<br>Missile Silo 576-C | Uncertain, probably similar to sites 5 and 6 | Atlas launches, probably similar to sites 5 and 6 (1963) | Uncertain, probably similar to sites 5 and 6 |
| Site 32<br>Missile Silo 576-D | Uncertain, probably similar to sites 5 and 6 | Atlas launches, probably similar to sites 5 and 6 (1963 - 1964) | Uncertain, probably similar to sites 5 and 6 |
| Site 33<br>Missile Silo 576-F | Uncertain, probably similar to sites 5 and 6 | Atlas launches, probably similar to sites 5 and 6 (1962 - 1964) | Uncertain, probably similar to sites 5 and 6 |
| Site 34<br>Missile Silo 576-F | Uncertain, probably similar to sites 5 and 6 | Atlas launches, probably similar sites 5 and 6 (1961 - 1964) | Uncertain, probably similar to sites 5 and 6 |
| Site 35<br>Missile Silo 576-G | Uncertain, probably similar to sites 5 and 6 | Atlas launches, probably similar to sites 5 and 6 (1962 - 1965) | Uncertain, probably similar to sites 5 and 6 |

Table 1 WASTE SITES, DISPOSAL HISTORY, AND WASTE CHARACTERISTICS - VANDENBERG AFB (Continued)

| IRP Site | Type of Waste | Method of Disposal and Approximate Dates | Waste Quantity or Landfill Capacity |
|---|---|---|---|
| Site 36 Space Launch Complex | Uncertain, probably similar to sites 25 and 26 | Thor missile launches, probably similar to sites 25 and 26 | Uncertain, probably similar to sites 25 and 26 |
| Site 37 Space Launch Complex | Uncertain, probably similar to sites 25 and 26 | Thor missile launches, probably similar to sites 25 and 26 (1959 - 1980) | Uncertain, probably similar to sites 25 and 26 |
| Site 38 Space Launch Complex | Uncertain, probably similar to sites 25 and 26 | Thor missile launches, probably similar to sites 25 and 26 (1958 - 1965 (+/-)) | Uncertain, probably similar to sites 25 and 26 |
| Site 39 Space Launch Complex No. 1 East | Uncertain, probably similar to sites 25 and 26 | Thor/Agena missile launches, probably similar to sites 25 and 26 | Uncertain, probably similar to sites 25 and 26 |
| Site 40 Space Launch Complex | Uncertain, probably similar to sites 25 and 26 | Thor/Agena missile launches, probably similar to sites 25 and 26 | Uncertain, probably similar to sites 25 and 26 |
| Site 41 Power Plant Six | Diesel fuel | Oil separator malfunction released diesel fuel repeatedly (1969 - present) | Unknown |
| Site 42 Fuel Decontamination Facility | Neutralized fuel | Surface disposal after lab tests (unknown - present) | Unknown |
| Site 43 Landfill No. 8 | Waste POLs, UXO, and construction debris | Landfill, no burning (area fill) (1961 - 1966) | 6-10 acres |
| Site 44 Fuel Tank Farm | Aviation gas, JP-4, RP-1, diesel fuel | Leaking aboveground & underground storage tanks (Unknown-present) | |

**ABBREVIATIONS**

| | | |
|---|---|---|
| AZ-50 | = | Aerozine-50 |
| DDT | = | 1,1,1-Trichloro-2,2-bis[p-chlorophyl]ethylene |
| IRFNA | = | Inhibited red-fuming Nitric Acid |
| JP-4 | = | Jet propulsion fuel #4 |
| MMH | = | Monomethyl hydrazine |
| N204 | = | Nitrogen tetraoxide |
| NDMA | = | N-Nitrosodimethylamine |
| PCB | = | Poly chlorinated binphenyl |
| POL | = | Petroleum, oil, lubricants |
| RJ-5 | = | Ram Jet #5 (rocket fuel) |
| RP-1/2 | = | Rocket propellant #1 or #2 |
| TCA | = | Trichloroethyane |
| TCE | = | Trichloroethylene |
| UDMH | = | Unsymmetrical dimethyl hydrazine |
| UXO | = | Unexploded ordnance |
| $H_2O$ | = | Water |
| NaOH | = | Sodium Hydroxide |
| HNO3 | = | Nitric Acid |
| HCL | = | Hydrochloric Acid |
| HF | = | Hydrofluoric Acid |

**SOURCES**

Reynolds
Smith and Hills, Inc.
Environmental Science and Engineering, Inc., 1985
Installation Restoration Program Phase I
Records Search
Vandenberg Air Force Base, California

## 3. HRS FACTORS

### 3.1 Observed Release

A release to groundwater of trichloroethylene (TCE) has been documented at sites 8 and 9 in the southern area of Vandenberg AFB. Sampling conducted in Fall 1987 by Battelle, the Air Force's consultant, found TCE in monitor wells 10-MW-1, 9-MW-1, 9-MW-2, and 8-MW-1, at concentrations of 59 µg/l, 8 µg/l, 16 µg/l, and 100 µg/l, respectively (refer to Figure 3). Samples taken from the same wells in Spring 1988 indicated the presence of TCE in concentrations of 110 µg/l, 5.4 µg/l, 14 µg/l, and 110 µg/l, respectively. In the background sample from the upgradient monitor well (8-MW-2), TCE was below the laboratory detection limit of 0.5 µg/l (10).

Trans-1,2-DCE, a known chemical breakdown product of TCE, was not detected in wells 8-MW-1 and 8-MW-2; however, it was found in wells 9-MW-2, 9-MW-1, and 10-MW-1 in maximum concentrations of 17 µg/l, 18 µg/l, and 60 µg/l, respectively. The presence of TCE and subsequent absence of trans-1,2-DCE in well 8-MW-1 lead Battelle to conclude that the sources of TCE contamination in the area are active launch sites 8 and 9 (10).

There is a potential for a release to groundwater at two space launch complex sites (sites 5 and 6). Samples taken in the vicinity of these sites from monitor wells 1, 27, and 28 (referred to as WETSU wells in the IRP Phase II document) showed the presence of TCE, but Battelle monitor wells drilled in the same area did not find TCE above detection limits.

A potential exists for a release to surface water at Vandenberg AFB as all waste sites are located within 3 miles of intermittent streams that serve as natural migration pathways to the following bodies of water on or near the base: Bear Creek Wetland, Santa Ynez River, San Antonio Creek, small lakes and ponds, and the Pacific Ocean.

A potential may exist for a release to air from sites where surface soil has been found to be contaminated. No air sampling has been conducted to date.

### 3.2 Direct Contact/Fire and Explosion

Vandenberg AFB is not open to the public and is fenced and guarded; thus, there is a low potential for the public to come into direct contact with any hazardous materials on-base.

There is a documented case of a Titan II missile explosion in a silo on-base (Site 27). It appears that there may be a potential for explosion at other sites on the base if proper safety precautions are not followed. In addition, there is a large quantity of combustible diesel

SOURCE: Battelle Denver Operations

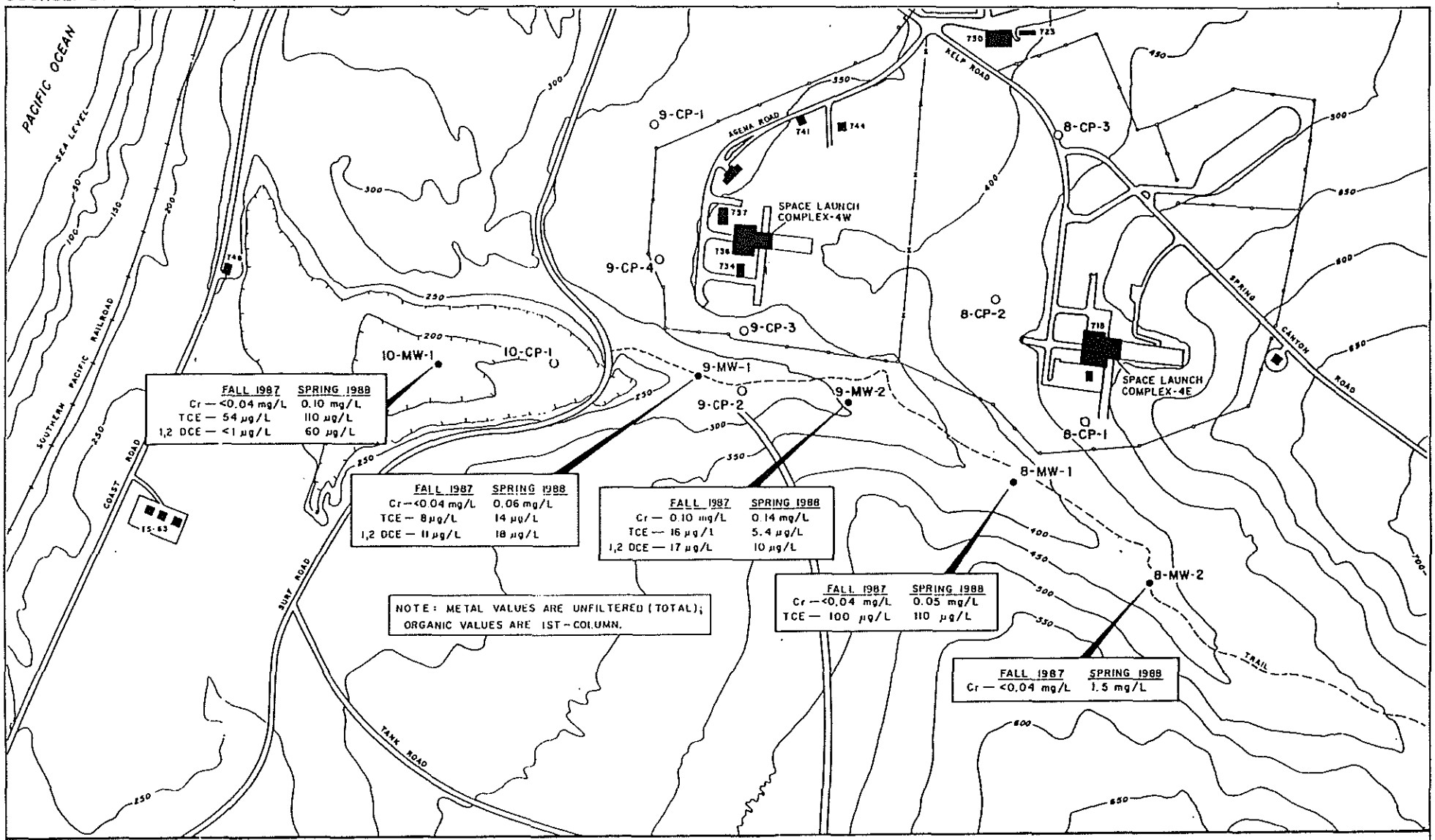


Figure 3 LOCATION OF GROUNDWATER CHEMICALS WITH CONCENTRATIONS ABOVE PRIMARY MCL AT SPACE LAUNCH COMPLEX 4E/4W/4SCP (SITES 8, 9, 10).

ecology and environment, inc.

fuel and rocket propellant stored on-base, particularly in the Fire Training Area (Site 21) (10). Vandenberg AFB does not appear to store incompatible wastes on-site.

### 3.3 Waste Type/Quantity

Present waste disposal practices have been fairly well documented at Vandenberg AFB. However, the information provided regarding disposal practices during the first three decades of the installation's history is inadequate (10).

The Phase II, Stage 1 final report includes a section describing individual site histories, waste disposal practices, and a table that summarizes waste type and quantity disposed of at each of the 44 sites investigated. Often specific information is unknown, particularly locations and quantities of wastes deposited on-site.

In summary, sites at Vandenberg AFB can be grouped in the following categories: those at which petroleum hydrocarbon-based fuels were known to have been used, stored or disposed of; landfill and drum disposal sites; space or missile launch sites at which hydrazine or similar rocket fuels may have been used or stored; a laundry site; and a wash rack where pesticides were mixed and equipment was rinsed (10).

Sites at which petroleum hydrocarbon-based fuels were used, stored or disposed of include:

- Base Exchange Service Station (Site 1),
- Old Service Station (Site 2),
- Fire Training Area (Site 21),
- Power Plant 6 (Site 41),
- Fuel Tank Farm (Site 44), and
- NASA Building 836 Ditch (Site 19).

Landfill and drum disposal sites include:

- Landfill No. 2 (Site 3),
- Landfill No. 3/4 (Site 18),
- Landfill No. 1/Drum Disposal Site No. 1 (Site 20),
- Landfill No. 11/11A (Site 22),
- Landfill No. 5 (Site 23), and
- Landfill No. 8 (Site 43).

Materials known to have been disposed of at landfill and drum disposal sites include sanitary trash, incinerator ash, unburnable slag, scrap metal, waste petroleum, oil and lubricants (POLs), waste solvents, pesticides, transformer oil, ordnance, paint, scrap missile material, polychlorinated biphenyl (PCB) contaminated soil, and construction debris (10).

Thirty sites were investigated at Vandenberg AFB that have been used or are presently being used for space or missile launches and related activities, including:

- Space Launch Complexes (Sites 5-10, 25, 26, and 36-40),
- Titan Tank Farm (Site 11),
- Agena Tank Farm (Site 12),
- ABRES-A/ABRES-A Lake (Sites 13 and 14),
- ABRES-B/ABRES-B Lake (Sites 15 and 16),
- Oxidation Ponds (Site 17),
- Exploded Missile Silo (Site 27),
- Missile Silos (Sites 28-35), and
- Fuel Decontamination Facility (Site 42).

At the launch sites and associated areas, various fuels, solvents and chemicals are used, including red-fuming nitric acid (IRFNA), nitrogen tetroxide, sodium hypochlorite, isopropyl alcohol, Freon 113, kerosene, diesel fuels, rocket fuels, TCE, and heavy metals (10).

At the Entomology Wash Rack (Site 24), pesticides have been mixed and pesticide spraying equipment has been washed and rinsed (10).

Although waste quantities are unavailable for most contaminants, Woodward-Clyde Consultants did provide an estimate of the amount of TCE discharged on-base: 20,000 gallons (1).

## 3.4 Groundwater

Of the 44 hazardous waste sites identified on-base, only eight sites are within 3 miles of a drinking water well. Seven sites are clustered around the South Vandenberg Well Field and one is located within 3 miles of the Santa Ynez Well Field. For this reason, the groundwater section has been broken down into two segments that assess the potential for a release to groundwater in the vicinity of these two well fields.

### 3.4.1 SOUTH VANDENBERG WELL FIELD

The Lompoc Terrace Groundwater Basin is considered a graben, an elongated, relatively depressed crystal unit surrounded by faults on its long sides (2). The basin consists of about 800 feet of permeable sediments, including Careaga sand, Orcutt sand, and recent alluvium. The unconfined aquifer in the basin has a water level ranging from 20 to 30 feet below ground surface (bgs). The two municipal wells, which comprise the South Vandenberg Well Field, draw water from 170 to 210 feet and from approximately 370 to 420 feet bgs in the unconfined Lompoc Terrace Aquifer (10). Water from these wells is used primarily for industrial use by facilities in the southern area of the base, and for irrigation during exceptionally dry periods. The potential population served by these wells is estimated to be around 500 base personnel; however, this water is generally not used for drinking due to its poor taste. Base personnel are provided with bottled drinking water (3). There is no

available evidence to indicate that the objectionable taste is associated with contamination from Vandenberg AFB. There are no residential areas serviced by these wells.

There are seven sites located within a 3-mile radius of the South Vandenberg Well Field. Of most concern are sites 8, 9 and 18. Site 18 is approximately 1 mile from the nearest well in the South Vandenberg Well Field. This site consists of two landfills where sanitary trash, waste POLs, pesticides, and construction debris were disposed of from 1958 to 1964. Due to the proximity of these landfills to the South Vandenberg wells there is the potential for contaminants to migrate to the well system supplying the southern region of the base. TCE was found in the groundwater at sites 8 and 9, located 3 miles from the well field (10).

Net seasonal precipitation (November through April) at Vandenberg AFB is -11.82 inches.

### 3.4.2 SANTA YNEZ WELL FIELD

There are four municipal wells located in the Santa Ynez Well Field. Water from these wells is used by the entire base (22,300 people) (10). The Titan Tank Farm (Site 11) is the only site within a 3-mile radius of the Santa Ynez Well Field. This site is presently undergoing remediation (9).

Presently, a greater percentage of Vandenberg's drinking water is received from municipal wells in the San Antonio River Basin, but these wells are being overdrawn (4). The wells are located in the remote northeastern region of the base, more than four miles from the nearest waste site, and do not appear to be threatened by potential groundwater contamination at this time. There is the possibility that in a few years emphasis will be shifted from the San Antonio wells to the Santa Ynez wells (4).

There are two aquifers in the Lompoc Plain Alluvium, one deep and one shallow. All wells in the Santa Ynez Well Field tap both aquifers. The deep aquifer is approximately 110 feet thick and is made up largely of coarse gravel, some sand, and very little silt or clay. The upper aquifer is from 75 to 100 feet thick, is largely composed of silt and clay, and has low average permeability. The consultant's report does not specify aquifer depths. There are beds of clay beneath the upper aquifer that may serve as a confining member, causing the lower aquifer to be under artesian pressure (10). It is unknown if this clay layer is continuous over a 3-mile radius around Site 11.

## 3.5 Surface Water

San Antonio Creek and the Santa Ynez River are the two major watersheds on-base; both discharge into the Pacific Ocean. The Pacific Ocean, small ponds, Bear Creek Wetland, and other smaller wetlands are all potential recipients of contaminants that might migrate from hazardous waste sites

at Vandenberg AFB. Several ephemeral streams on-base may serve as migration pathways for potentially contaminated surface runoff. Although every site on-base is within 3 miles of surface water, the following analysis is limited to those sites that appear to pose the greatest threat based on evidence of soil and groundwater contamination, proximity to surface water, waste characteristics, and waste containment (10).

There are four sites identified which have a potential to release contaminants to freshwater aquatic habitats on-base. Sediments contaminated with petroleum hydrocarbons have been found in the lake at Site 16. Base personnel report that there are no longer any fish in this lake (10). Although refined petroleum fractions and crude oil are exempt under the CERCLA Petroleum Exclusion, if the petroleum is contaminated with hazardous constituents, the contaminants are not exempt (8). TCE from the space launch complex at Site 5 has a 1-mile migration pathway to Bear Creek Wetland, and contaminants detected at the landfill (Site 20) and the Entomology Wash Rack (Site 24) have a 1.5-mile pathway to lakes in Lake Canyon.

There are many sites at Vandenberg AFB that are located within 1 mile of the Pacific Ocean and may threaten marine habitat, particularly the nearshore productive tidepool zone. Of particular concern are the space launch complexes at sites 8, 9, and 10, where surface water and groundwater samples were found to be contaminated with organic chemicals and TCE. There are five sites situated near the ocean with the potential to discharge into the ocean through seeps that have been observed flowing into tidepools along the beach. Four of these are launch sites that lie along a 3-mile frontage south of Purisima Point (Sites 25, 26, 39, and 40) and the fifth site (Site 5) drains into the Bear Creek Ponding Area (10).

Commercial fishing for halibut, sea urchins, and hagfish is conducted off the coast of Vandenberg and abalone is caught within 3 miles of the coast (5). Approximately 30,000 to 40,000 pounds of fish are caught in this area each year (6).

There are several species on Vandenberg AFB that are listed by the State of California and the U.S. Fish and Wildlife Service as endangered. The three spine stickleback (Gasterosterus aculeatus) is found in the area of El Rancho Road, and in the San Antonio Creek and Santa Ynez River. The Pacific leatherback turtle (Dermochelus coricea) has been seen occasionally along the Pacific shoreline. Also, the American peregrine falcon, the California brown pelican, the California least tern, the light-footed clapper rail, and the southern bald eagle either reside or have been sighted on-base (12).

Surface water use at Vandenberg AFB is limited to industrial use (space launch complexes), fishing, and boating. It is not used for domestic purposes (7).

### 3.6 Air

Soil contamination has been detected at several sites at Vandenberg AFB; therefore, there is a potential for a release to air. Of particular concern are those sites which are within four miles of a residential or business area. This includes all sites on the base except those that are located in the extreme northern and southern regions. The populations that could possibly be affected by a release to the air are 22,300 people on-base as well as 2,600 people who reside or work at the U.S. Penitentiary and adjacent facility. It is not known what portion of the base population is military personnel. Under the current HRS model, personnel cannot be included in the potential air target population.

Soil samples taken from the landfill at Site 3 show contamination by petroleum hydrocarbons, cyanide, arsenic, and cadmium. Shallow soil samples taken from the ponding areas below lined ditches at the exploded missile silo (Site 27) are contaminated with up to 8,500 mg/kg of petroleum hydrocarbons. Petroleum hydrocarbons were also found in the soil at the Site 31 missile silo and the space launch complex at Site 26 (10). Although the petroleum contamination is exempt under the CERCLA Petroleum Exclusion, the heavy metals are not exempt (8).

The Fire Training Area (Site 21) is of particular concern. A petrex soil gas survey detected benzene, toluene, ethylbenzene, and xylene on-site. These compounds are all components of jet fuel JP-4, which was used in fire training practices. In addition, high levels of petroleum hydrocarbons were found in the old burn pit, the active burn pit, and the drainage ditch at Site 21. Pesticides were found in the soil at the Entomology Wash Rack (Site 24) (10).

## 4. PROPOSED REVISED HRS CONSIDERATIONS

Under the proposed revised HRS model (rHRS) there is greater emphasis given to sensitive environments within 4 miles of the site. The model gives high priority to wetlands and habitat known to be critical to federal and/or state designated endangered species. As mentioned in Section 3.5, there are many sites at Vandenberg AFB which have a potential to release contaminants to sensitive areas.

Another significant revision to the HRS Model increases the distance from the site to drinking water wells from 3 to 4 miles for determining the potential groundwater target population. This distance increase affects the analysis of Vandenberg AFB as it adds two additional sites to be considered around each well field. Of these four sites, the most important is the landfill at Site 3, which is 4 miles from the Santa Ynez Well Field. This site was given the highest priority of the 11 sites analyzed in the Phase I investigation (12). The Phase II investigation concluded that this landfill requires further investigation and currently warrants some form of remediation or long-term monitoring (10).

Finally, the rHRS model will likely allow on-base personnel to be included in the potential air target population. However, since the potential for contaminant release to air is calculated on a source-by-source basis, and not combined for the entire facility, Vandenberg does not show potential for inclusion on the NPL for the air route.

## 5. CONCLUSIONS

It appears that Vandenberg Air Force Base is not eligible for inclusion on the National Priorities List for the following reasons:

- Although there has been an observed release to groundwater 2 miles from the South Vandenberg Well Field, the potential target population for these wells is small;
- There appears to be a low potential for contamination of wells in the Santa Ynez Well Field because distance to the nearest site is 3 miles;
- There has been no observed release to surface water or air; and
- The potential surface water target population is small because there are no drinking water targets.

## 6. EPA RECOMMENDATION

| | Initial | Date |
|---|---|---|
| No Further Remedial Action Planned | _____ | _____ |
| Listing Site Inspection | gd | 9/12/89 |

Notes:

Further investigation of air pathway needed. High target population



wp/kh/vandenberg/ffsi

## REFERENCES


1. Vais, Christopher L., Woodward-Clyde Consultants, to Nicholas Morgan, U.S. Environmental Protection Agency, letter, October 1, 1985.

2. Rhodes, Frank H. T., Geology; Western Publishing Company, Inc., Racine, Wisconsin, 1972.

3. Tassey, Roberta, Ecology and Environment, Inc., and Kim Hall, Vandenberg AFB, telephone conversation, June 2, 1989.

4. Hom, Tom, Ecology and Environment, Inc., and Kim Hall, telephone conversation, June 2, 1989.

5. McElligot, Mike, Ecology and Environment, Inc., and Kim Hall, Vandenberg AFB, telephone conversation, June 2, 1989.

6. MBC Applied Environmental Sciences, "Union Oil Project/Exxon Project Shamrock, and Central Santa Maria Basin Area Study EIS/EIR, Technical Appendix E," March 18, 1985.

7. Tassey, Roberta, Ecology and Environment, Inc., and Kim Hall, Vandenberg AFB, telephone conversation, July 31, 1989.

8. Blake, Francis S., U.S. Environmental Protection Agency, Memorandum, "Scope of the CERCLA Petroleum Exclusion Under Sections 101 (14) and 104 (a)(2)," July 31, 1987.

9. Tassey, Roberta, Ecology and Environment, Inc., and Kim Hall, Vandenberg AFB, telephone conversation, June 6, 1989.

10. Battelle Columbus Division, "Installation Restoration Program, Phase II", Vandenberg AFB, California, March 1989.

11. Rison, Richard, Ecology and Environment, Inc., and Kim Hall, United States Penitentiary at Lompoc, telephone conversation, August 10, 1989.

12. Environmental Science and Engineering, Inc., "Installation Restoration Program, Phase I", Vandenberg AFB, California, January 1985.

CONTACT REPORT

| | | |
|---|---|---|
| **AGENCY/AFFILIATION:** Vandenberg AFB | | |
| **DEPARTMENT :** | | |
| **ADDRESS/CITY:** Vandenberg | | |
| **COUNTY/STATE/ZIP:** Santa Barbara County, California | | |
| **CONTACT(S)** | **TITLE** | **PHONE** |
| 1. Roberta Tassay | | 805-866-5724 |
| 2. | | |
| **E & E PERSON MAKING CONTACT:** Kim Hall | | **DATE:** 07/31/89 |
| **SUBJECT:** Surface Water Targets, WETSU Wells | | |
| **SITE NAME:** Vandenberg AFB | | **EPA ID#:** CA9570025149 |

1. There are no surface water drinking targets.

2. The United States Penitentiary at Lompoc is located on the eastern boundary of the base, only a few miles from Lompoc.

c/kh/vandenberg/cr

CONTACT REPORT

| | | |
|---|---|---|
| **AGENCY/AFFILIATION:** U.S. Penitentiary | | |
| **DEPARTMENT :** | | |
| **ADDRESS/CITY:** Lompoc | | |
| **COUNTY/STATE/ZIP:** Santa Barbara County, California | | |
| **CONTACT(S)** | **TITLE** | **PHONE** |
| 1. Richard Rison | Warden | 805-735-2771 |
| 2. | | |
| **E & E PERSON MAKING CONTACT:** Kim Hall | | **DATE:** 8/10/89 |
| **SUBJECT:** Population | | |
| **SITE NAME:** Vandenberg AFB | | **EPA ID#:** CA9570025149 |

1) The U.S. Penitentiary has an inmate population of 1,430 people and a staff of 410.

2) The low-security facility near the penitentiary has an inmate population of 640 and a staff of 130.

c/kh/vandenberg/cr

## REFERENCES


1. Vais, Christopher L., Woodward-Clyde Consultants, to Nicholas Morgan, U.S. Environmental Protection Agency, letter, October 1, 1985.

2. Rhodes, Frank H. T., Geology; Western Publishing Company, Inc., Racine, Wisconsin, 1972.

3. Tassey, Roberta, Vandenberg AFB, and Kim Hall, Ecology and Environment, Inc., telephone conversation, June 2, 1989.

4. Hom, Tom, and Kim Hall, Ecology and Environment, Inc., telephone conversation, June 2, 1989.

5. McElligot, Mike, Vandenberg AFB, and Kim Hall, Ecology and Environment, Inc., telephone conversation, June 2, 1989.

6. MBC Applied Environmental Sciences, "Union Oil Project/Exxon Project Shamrock, and Central Santa Maria Basin Area Study EIS/EIR, Technical Appendix E," March 18, 1985.

7. Tassey, Roberta, Vandenberg AFB, and Kim Hall, Ecology and Environment, Inc., telephone conversation, July 31, 1989.

8. Blake, Francis S., U.S. Environmental Protection Agency, Memorandum, "Scope of the CERCLA Petroleum Exclusion Under Sections 101 (14) and 104 (a)(2)," July 31, 1987.

9. Tassey, Roberta, Vandenberg AFB, and Kim Hall, Ecology and Environment, Inc., telephone conversation, June 6, 1989.

10. Battelle Columbus Division, "Installation Restoration Program, Phase II", Vandenberg AFB, California, March 1989.

11. Rison, Richard, United States Penitentiary at Lompoc, and Kim Hall, Ecology and Environment, Inc., telephone conversation, August 10, 1989.

12. Environmental Science and Engineering, Inc., "Installation Restoration Program, Phase I", Vandenberg AFB, California, January 1985.

## APPENDIX A

## FURTHER INFORMATION NEEDS

Further information is needed to adequately assess the potential for a release to the air route. Additionally, all proposed revised HRS criteria for the groundwater, surface water, and air routes should be addressed.

PA/SI CONTACT LOG

Facility Name: Vandenberg Air Force Base
Facility ID: CA0570025149

| Name | Affiliation | Phone # | Date | Information |
|---|---|---|---|---|
| Mike McElligott | Vandenberg | 805-866-9687 | 6/2/89 | See Contact Report |
| Roberta Tassey | Vandenberg | 805-866-5724 | 6/2/89 | See Contact Report |
| Tom Hom | City of Lompoc | 805-866-8147 | 6/2/89 | See Contact Report |
| Miteh Jofuku | Vandenberg AFB | 805-866-5724 | 7/26/89 | There are no surface drinking water targets. Some lakes on-base are used for swimming and boating. |
| Richard Rison Warden | United States Penitentiary at Lompoc | 805-735-2771 | 8/10/89 | See Contact Report |

c/kh/vandenberg/cr

# CONTACT REPORT

| | | |
|---|---|---|
| **AGENCY/AFFILIATION:** Vandenderg AFB | | |
| **DEPARTMENT :** | | |
| **ADDRESS/CITY:** Vandenberg | | |
| **COUNTY/STATE/ZIP:** Santa Barbara County, CA 93437-5000 | | |
| **CONTACT(S)** | **TITLE** | **PHONE** |
| 1. Major La Poe | | (805) 866-5724 |
| 2. Roberta Tassey | | (805) 866-5724 |
| **E & E PERSON MAKING CONTACT:** Kim Hall | | **DATE:**6/2/89 |
| **SUBJECT:** South Vandenberg Wells | | |
| **SITE NAME:** Vandenberg AFB | | **EPA ID#:** CA9570025149 |

1) The South Vandenberg Wells are not interconnected with the wells on the rest of the base.

2) The South Vandenberg Wells service only those people who work in the facilities located in the southern part of the base, approximately 500 people.

3) These wells are only used for irrigation during a drought. Generally area does not need to be irrigated.

4) Drinking water is supplemented by bottled water in the southern base facilities.

c/kh/vandenberg/cr

CONTACT REPORT

| | | |
|---|---|---|
| **AGENCY/AFFILIATION:** City of Lompoc | | |
| **DEPARTMENT :** Engineering contracts Branch | | |
| **ADDRESS/CITY:** Lompoc | | |
| **COUNTY/STATE/ZIP:** Santa Barbara County, California | | |
| **CONTACT(S)** | **TITLE** | **PHONE** |
| 1. Tom Hom | Chief | (805) 866-8147 |
| 2. | | |
| **E & E PERSON MAKING CONTACT:** Kim Hall | | **DATE:** 6/2/89 |
| **SUBJECT:** Wells | | |
| **SITE NAME:** Vandenberg AFB | | **EPA ID#:** CA9570025149 |

The wells in the San Antonio Well Field are currently being overdrawn. Soon nore groundwater will have to be drawn from the Santa Ynez Well Field.

c/kh/vandenberg/cr

# CONTACT REPORT

| | | |
|---|---|---|
| **AGENCY/AFFILIATION:** Vandenberg AFB | | |
| **DEPARTMENT :** | | |
| **ADDRESS/CITY:** Vandenberg | | |
| **COUNTY/STATE/ZIP:** Santa Barbara County, California | | |
| **CONTACT(S)** | **TITLE** | **PHONE** |
| 1. Mike McElligott | | (805) 866-9687 |
| 2. | | |
| **E & E PERSON MAKING CONTACT:** Kim Hall | | **DATE:**6/2/89 |
| **SUBJECT:** Endangered species | | |
| **SITE NAME:** Vandenberg AFB | | **EPA ID#:** CA9570025149 |

1) There is commercial fishing off the coast of Vandenberg for abalone sea urchin, halibut, and hagfish.

2) The is not familiar with endangered species that might reside on Bear Creek Wetland - but there are many endangered species on the base.

c/kh/vandenberg/cr

CONTACT REPORT

| | | |
|---|---|---|
| **AGENCY/AFFILIATION:** Vandenberg AFB | | |
| **DEPARTMENT :** | | |
| **ADDRESS/CITY:** Vandenberg | | |
| **COUNTY/STATE/ZIP:** Santa Barbara County, California | | |
| **CONTACT(S)** | **TITLE** | **PHONE** |
| 1. Roberta Tassey | | (805) 866-5724 |
| 2. | | |
| **E & E PERSON MAKING CONTACT:** Kim Hall | | **DATE:**6/6/89 |
| **SUBJECT:** Miscellaneous | | |
| **SITE NAME:** Vandenberg AFB | | **EPA ID#:** CA9570025149 |

1) 1980 Ground Water Quality Report - Lompoc Terrace aquifer is probably connected to the Santa Ynez aquifer at some point.

2) There are endangered species on the base but none reside in the Bear Creek Wetland.

3) She noticed that BHC was found in a groundwater sample taken from B2-HW-1, but is unsure about the accuracy of this result.

4) WETSU Well 30 is dry.

5) Titan Tank Farm is presently undergoing remedial clean-up.

c/kh/vandenberg/cr